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NATIONAL IRANIAN OIL REFINING & DISTRIBUTION COMPANY
NATIONAL IRANIAN OIL ENGINEERING
& CONSTRUCTION COMPANY

NIOEC SP

NIOEC SPECIFICATION FOR PIPELINE DESIGN CRITERIA

SECOND EDITION

MARCH 2018

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IN THE NAME OF GOD**FOREWORD**

By their very nature, technical Specifications are continuously subject to modifications and revisions. To strengthen their merit and usefulness, continuous improvements, addendum, deletion of disparate information and consequently provision of updated revisions are to be made in order to ascertain that such Specifications meet the current requirements, inclusive of Iranian Petroleum Standards (IPS) and the recognized and acceptable national and international Standards, as well as the optimal codes and practices based on the accumulated in-house know-how and plant knowledge and experiences.

However, in reality, due to several reasons, not to mention the complexity of the matter, the ultimate goal of continuous direct embedment of the required changes on the relevant Specifications may be far reaching. Therefore, in the interim periods between the officially issued revisions, the required changes will appear in other documents related to the engineering and design work of the ongoing projects.

In response to the initiative of the Design and Engineering Directorate, and considering that the task of the execution of several important and mega projects for the realization of the new oil refineries, pipelines and oil terminals as well as improvements of the existing facilities, has been assigned to NIOEC, it was decided to update the NIOEC Specifications and to issue new official revisions.

The Design and Engineering Directorate was itself entrusted to carry out this important task, and as such by forming several special technical committees, working in close co-operation and cohesion and sharing their expertise and knowledge, the updated and revised NIOEC Specifications were successfully prepared and complied.

These Specifications are intended to be used for Oil Refineries, Distribution Depots, Oil Terminals, Pipelines and Pump Stations within NIOEC's projects, and have been proven to be of high value for such purposes. It must however be appreciated that these Specifications represent the minimum requirements and should in no way be interpreted as a restriction on the use of better procedures, engineering and design practices or materials.

We encourage and highly appreciate the users and other clear sighted and experts to send their comments on the Specifications to the Design and Engineering Director of NIOEC for evaluation and approval.

REVISION INDEX

REV. PAGE	1	2	3	4	5	REV. PAGE	1	2	3	4	5	REV. PAGE	1	2	3	4	5	REV. PAGE	1	2	3	4	5
1	x					26						51						76					
2	x					27						52						77					
3	x					28						53						78					
4	x					29						54						79					
5	x					30						55						80					
6	x					31						56						81					
7	x					32						57						82					
8	x					33						58						83					
9	x					34						59						84					
10	x					35						60						85					
11	x					36						61						86					
12	x					37						62						87					
13	x					38						63						88					
14	x					39						64						89					
15	x					40						65						90					
16	x					41						66						91					
17	x					42						67						92					
18	x					43						68						93					
19	x					44						69						94					
20	x					45						70						95					
21	x					46						71						96					
22	x					47						72						97					
23	x					48						73						98					
24	x					49						74						99					
25	x					50						75						100					

NOTES:

- 1) THIS SHEET IS A RECORD OF ALL REVISIONS TO THIS SPECIFICATION.
- 2) WHEN APPROVED EACH REVISION SHALL BE CONSIDERED AS A PART OF THE ORIGINAL DOCUMENT.
- 3) NUMBER OF PAGES EXCLUDES THIS SHEET AND THE COVER SHEET

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CONTENTS:	PAGE NO.
1. SCOPE.....	2
2. REFERENCES	2
3. UNITS.....	4
4. DEFINITION.....	4
5. DESIGN.....	4
5.1 Hydraulic Design	4
5.2 Mechanical Design.....	5
6. MATERIAL	11
6.1 General	11
6.2 Line Pipe.....	11
6.3 Valves.....	11
6.4 Fittings, Flanges, Gaskets, Branch Connections, etc.	12
7. PIPELINE ANCHORS, SUPPORTS, GUIDES, SHOES, ETC.	12
7.1 General	12
7.2 Pipeline Over-Crossing	12
7.3 Attachment of supports or anchors	12
8. PIPELINE ROUTE.....	12
8.1 General	12
8.2 Route Survey.....	13
8.3 Right-Of-Way.....	14
9. BURIED PIPELINES	14
9.1 General.....	14
9.2 Trench Dimensions.....	14
9.3 Corrosion Protection.....	15
9.4 Thermal Expansion	16
9.5 Pipeline Anchors.....	16
10. CROSSINGS.....	17
10.1 MAJOR RIVER CROSSINGS	17
10.2 ROAD, RAILWAY AND PIPELINE CROSSINGS.....	18
10.3 Asphalt Road Crossings.....	18
10.4 Gravel Road Crossings	19
10.5 Pipeline Crossings	19
10.6 Fault Crossing.....	19
11. CATHODIC PROTECTION FACILITIES.....	20
12. INTERNAL CORROSION ALLOWANCES	20
13. CORROSION INHIBITION AND MONITORING	20
14. LEAK DETECTION SYSTEM.....	20
15. CONSTRUCTION	21

1. SCOPE

1.1 These Design Criteria defines NIOEC's minimum requirements to be implemented in the design of off-plot onshore pipelines used for pipeline transportation systems/facilities for liquid hydrocarbons and other liquids.

Included the following installations:

- Pumping stations
- Scraper trap stations
- Pipeline Terminals
- Any intermediate sectional and isolating valves and other installations directly associated with the pipelines, such as vent & drain valves.

1.2 Engineering and design requirements which have not been mentioned in this specification shall be referred to NIOEC-SP-50-63.

1.3 Deviation from this specification will only be permitted on obtaining written approval from NIOEC.

Resolution on cases not explicitly stipulated in this Specification, or on cases where conflicts may arise among the requirements of the referenced IPS and the international standards, shall be made through written consent and approval of NIOEC.

2. REFERENCES

The following standards, codes, and specifications, to the extent specified hereinafter, shall constitute a part if this NIOEC Specification. Latest edition of the undated referenced documents and the cited edition of the dated references shall apply. The applicability of changes made to the dated references, after the cited date shall be mutually agreed upon between NIOEC and the Vendor/Contractor.

API (AMERICAN PETROLEUM INSTITUTE)

API 5L	Specification for Line Pipe
API 6D	Specification for Pipeline Valves
API 1104	Welding of Pipelines and Related Facilities

ASME (AMERICAN SOCIETY OF MECHANICAL ENGINEERS)

ASME B16.5	Steel pipe flanges and flanged fittings
ASME B31.4	Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids

MSS (MANUFACTURERS STANDARDIZATION SOCIETY)

MSS-SP-44	Steel Pipeline Flanges
MSS-SP-45	Bypass and Drain Connections

ISO (INTERNATIONAL STANDARD)

ISO-13623	Petroleum and natural gas industries-Pipeline transportation systems
ISO 3183	Petroleum and natural gas industries Steel pipe for pipeline transportation

Systems

NACE

NACE MR0175/ ISO15156

Petroleum and natural gas industries Materials for use in H₂S- containing environments in oil and gas production

NIOEC-SP (NIOEC SPECIFICATIONS)

NIOEC-SP-00-10	NIOEC Specification for Units
NIOEC-SP-50-51	NIOEC Specification for line pipe
NIOEC-SP-50-52	NIOEC Specification for pipe line valves
NIOEC-SP-50-53	NIOEC Specification for anchor flange
NIOEC-SP-50-62	NIOEC Specification for Transportation Pipeline (Onshore) Pressure Testing
NIOEC-SP-50-63	NIOEC Specification for Pipeline Engineering
NIOEC-SP-60-24	NIOEC Specification for Cathodic Protection System
NIOEC-SP-80-01	NIOEC Specification for Insulation
NIOEC-SP-80-51	NIOEC Specification for Three Layers Polyethylene Coating System
NIOEC-SP-90-51	NIOEC Specification for Welding of Transportation Pipeline
NIOEC-SP-80-52	NIOEC Specification for factory-applied coatings for buried and submerged pipes dual-layer fusion bonded epoxy coatings

NIOEC-SD (NIOEC STANDARD DRAWINGS)

NIOEC-SD-55-01	Pipeline Right of Way
NIOEC-SD-55-05-1/2	Pipeline road crossing major & secondary road crossing
NIOEC-SD-55-05-2/2	Pipeline road crossing typical arrangement of cased pipe road crossing
NIOEC-SD-55-06	Pipeline single track rail road crossing
NIOEC-SD-55-07	Pipeline water way and QANAT crossing
NIOEC-SD-55-08	Pipeline stream or river crossing concrete coat and set on weight details
NIOEC-SD-55-09	Pipeline irish crossing
NIOEC-SD-55-10	Pipeline detail of marker & warning plate at cased crossing

IPS (IRANIAN PETROLEUM STANDARDS)

IPS-C-PI-140	Construction standard for transportation pipelines (onshore)
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3. UNITS

International system of units (SI) shall be used in accordance with NIOEC-SP-00-10, unless otherwise specified.

4. DEFINITION

Fence Valve

Fence valve is referred to the Main block valve which is located in the plant (pumping stations, terminal & intermediate stations) inlet/outlet main line.

Major Rivers

Major Rivers are referred to those rivers with four-season water flow.

On- Plot

Those facilities which are confined within a boundary limit by fence or alike and shall be designed per ASME B31.3 & ASME B 31.4

Right-Of-Way

Strip of land on which pipelines, railroads, power lines, roads, highways, and other similar facilities are constructed. Generally, a written ROW agreement secures the right to pass over property owned or occupied by others. ROW agreements generally allow the right of ingress and egress for the installation, operation, and maintenance of the facility. ROW width varies based upon such factors as existing land use, construction work space, environmental restrictions, and maintenance requirements of the facility. The width is typically specified in the ROW agreement, following negotiation with the affected landowner, by legal action, or by permitting authority.

Pipeline (Main Oil Trunk Line):

A system of pipes and other components used for the transportation of fluids between (but excluding) plants. A pipeline extends from fence valve/trap of one plant to fence valve/trap of the next plant.

5. DESIGN

5.1 Hydraulic Design

5.1.1 General

In order to determine the possible range of operational parameters of the pipeline, a hydraulic analysis should be performed. For a given pipe size, fluid properties and flow rate (Maximum and Minimum), the hydraulic analysis should provide the pressure and temperature profiles along the pipeline for steady state and transient condition. Hydraulic design of pipeline shall include summer and winter conditions.

Velocity limitation and pressure drop calculations shall be considered as per NIOEC-SP-50-63.

5.1.2 Internal Design Pressure

The pipe and components at any point in the pipeline shall be designed for an internal design pressure that shall not be less than the maximum steady-state operating pressure at that point, nor

less than the static head pressure at that point with the pipeline in a static condition. The maximum steady-state operating pressure shall be the sum of the static head pressure, pressure required to overcome friction losses, and applied back pressure. Credit may be taken for hydrostatic external pressure by modifying the internal design pressure for use in calculations involving the pressure design of pipe and components. Pressure rise above maximum steady-state operating pressure due to surges and other variations from normal operations is allowed in accordance with the following criteria.

5.1.3 Criteria for Transient Overpressure

Transient overpressure includes pressure rise due to surge. Surge pressures in a liquid pipeline are produced by a change in the velocity of the moving fluid that results from shutting down a pump station or pumping unit, closing a valve, or blockage of the moving fluid. Surge calculations should be made and adequate controls and protective equipment shall be provided so that the pressure rise due to surges and other variations from normal operations shall not exceed the internal design pressure at any point in the piping system and equipment by more than 10%.

5.1.4 Surge Pressure

The occurrence and amplitude of pressure surges should be determined by transient pressure analysis, using a specialized simulation computer program for all probable scenarios. The pipeline system shall be designed such that surge pressures cannot exceed incidental pressure at any point along the pipeline, and will not trigger the system for overpressure protection from the upstream facility if fitted.

5.2 Mechanical Design

5.2.1 General

- Facilities shall be provided on all pipelines to enable the lines to be pigged before commissioning and on "main lines" during operation.
- Adequate means of isolation must be provided to enable all sections of pipelines and associated piping to be hydrostatically tested.
- Vent and drain connections shall be provided where necessary for satisfactory commissioning and operation. Vent and drain lines to atmosphere shall be extended to a location where fluids can be discharged safely
- Insulating joints shall be provided where necessary in cathodic protected lines and where the pipeline enters into the pumping stations, etc. Particularly to isolate unprotected installations from protected Installations. In lieu of insulating joint on small river overcrossings, the pipeline may be insulated from all supports and unprotected facilities.
- Bends should have a sufficient radius to allow passage of those types of pigs which are anticipated to pass through them (such as intelligent pigs). The minimum radius of bend shall be 7D.
- Hot bends shall comply with NIOEC-SP-50-60 and Cold bends shall be as per the requirement of ASME B31.4.

NOTE:

- In intermediate pump stations with bypass capability, the class rating of pipes and accessories and equipments between pump station entrance and first main pump shall be designed with bypass class rating.